THREE NEW SPECIES OF *ELEUTHERODACTYLUS* (AMPHIBIA: LEPTODACTYLIDAE) FROM HIGH ELEVATIONS OF THE CORDILLERA CENTRAL OF COLOMBIA

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Resumen

LYNCH, J.D., RUIZ-CARRANZA, P.M. & ARDILA-ROBAYO, M.C.: Three new species of *Eleutherodactylus* (Amphibia: Leptodactylidae) from high elevations of the Cordillera Central of Colombia - Caldasia **18**(3): 329-342, 1996. - ISSN 366-5232.

Se describe una especie nueva del grupo de *Eleutherodactylus orcesi* del Páramo de los Valles (Tolima). Esta especie es muy parecida a *E. simoterus* pero se distingue por su tamaño (la especie nueva es la más pequeña del grupo). Se describe también una especie enanita del Páramo de los Valles que posiblemente es una especie del grupo de *Eleutherodactylus myersi*. La especie es muy distinta porque carece de tímpano. Finalmente, se describe una especie grande y negra que se encuentra desde Antioquia hacia Cauca en la Cordillera Central. Con estas especies, tenemos 15 especies de *Eleutherodactylus* conocidas de los páramos y subpáramos de la Cordillera Central al norte del Macizo de Pasto, que pertenecen a cuatro grupos de especies.

Palabras clave: *Eleutherodactylus*, Páramo, Taxonomía.

Abstract

A new species of the *Eleutherodactylus orcesi* group, the smallest member of the group, is described from the Páramo de los Valles (Tolima). It is very similar to *E. simoterus*. From the same locality, a new species of dwarf *Eleutherodactylus*, lacking a tympanum, is described. It appears to be a member of the *E. myersi* group. Lastly, a new large black *Eleutherodactylus* is described from páramo and subpáramo habitats of the Cordillera Central. This species is distributed from Antioquia to Cauca. With these three species, fifteen species of *Eleutherodactylus* are known for páramo and subpáramo habitats of the Cordillera Central north of the Macizo de Pasto. These 15 species belong to four species groups.

Key words: *Eleutherodactylus*, Paramo, Taxonomy.

Introduction

The frog genus *Eleutherodactylus* is known from páramo and subpáramo habitats in the Cordillera Central (north of the Macizo de Pasto) on the basis of five species described by LYNCH (1980a) as well as *E. buckleyi* (LYNCH, 1981) and a frog called *E. supernatis* by LYNCH (1980b). We recently (LYNCH *et al.*, 1994) revised *E. supernatis* and divided it into a southern species (*E. supernatis*) and a northern species (*E. permixtus*), the latter which occurs abundantly from the Los Nevados district north on the Cordillera Central. Three other small species were described by LYNCH (1991). These ten species appear to belong to three species groups: the *E. devillei* group (*E. permixtus* and *E. supernatis*), the *E. leptolophus* group (*E. leptolophus*, *E. maculatus*, *E. peraticus*, *E. scoloblepharus*, and *E. uranobates*), and the *E. orcesi* group (*E. obmutescens*, *E. racemus*, and *E. simoterus*).

Fieldwork by the authors during the past decade has resulted in collections from many additional sites along the spine of the Cordillera Central with substantial increases in the known distributions of several species. These collections also produced a sufficient number of specimens of an uncommon species, first collected by P. M. Ruiz in 1970, to permit its description. We also take this opportunity to describe two species found on the Páramo de los Valles (Departamento Tolima).

Materials and methods

Methods and descriptive terms are described in Lynch & Duellman (1980). The following abbreviations are used in the text: E-N (eye to nostril distance), HW (head width), IOD (interorbital distance), and SVL (snout to vent length). Means are reported as ± one standard error of the mean. All specimens are in the amphibian collection of the Instituto de Ciencias Naturales Museo de Historia Natural (ICN-MHN), Universidad Nacional de Colombia, Santafé de Bogotá, and the Museo de Historia Natural (UVC), Universidad del Valle, Cali.

Taxonomic Accounts

The *Eleutherodactylus orcesi* group was recognized by Lynch (1981) for a series of páramo species distributed from the Los Nevados district of Colombia (Departamentos Caldas and Tolima) south along the spine of the Cordillera Central to the Macizo de Pasto and into north-central Ecuador. These species all share the peculiar feature of an anteriorly exposed frontoparietal fontanelle but the feature is unlikely to be derived. We here report additional distributional and other information for three of the described species (*E. obmutescens*, *E. racemus*, and *E. simoterus*) and describe an additional species of this group.

Eleutherodactylus obmutescens Lynch

When described (Lynch 1980a), the species was known only from the vicinity of Laguna San Rafael in the Páramo de Puracé but it has been collected since on the Alto de Guanacas and on the Páramo de Santo Domingo (Fig. 1) where it is sympatric with *E. buckleyi* but seems to occupy more mesic facies of the microhabitat. In life, *E. obmutescens* is dark brown to yellowish-olive above with few brown spots dorsally. The flanks are spotted with dark brown. The throat is yellow to gray-brown and the venter gray to pale brown. The groin and posterior surfaces of the thighs are reddish-brown. The iris is brown with copper flecks and a dark brown horizontal streak.

Eleutherodactylus racemus Lynch

This species was known only from the Páramo de Las Hermosas (actually, from the Alto de Pan de Azúcar, Depto. Valle del Cauca) at elevations of 3030-3570 m (Lynch 1980a) but has since been found along some 200 km of the Cordillera Central (Fig. 1), as far north as Cerro El Campanario, Quindío - Tolima border, 3460-3560 m. The new material does not require revising the original description but we did encounter a female "brooding" recently deposited eggs.

Eleutherodactylus simoterus Lynch

This species remains known from the N and NE flanks of Nevado del Ruiz at elevations between 3200 and 4100 m (Fig. 1). The highest elevation site is at the former INDERENA cabaña, El Arenal, where the periglacial winds do not completely desiccate the habitat. In spite of occurring at high elevations, the species is active at night. Males were calling on 23-

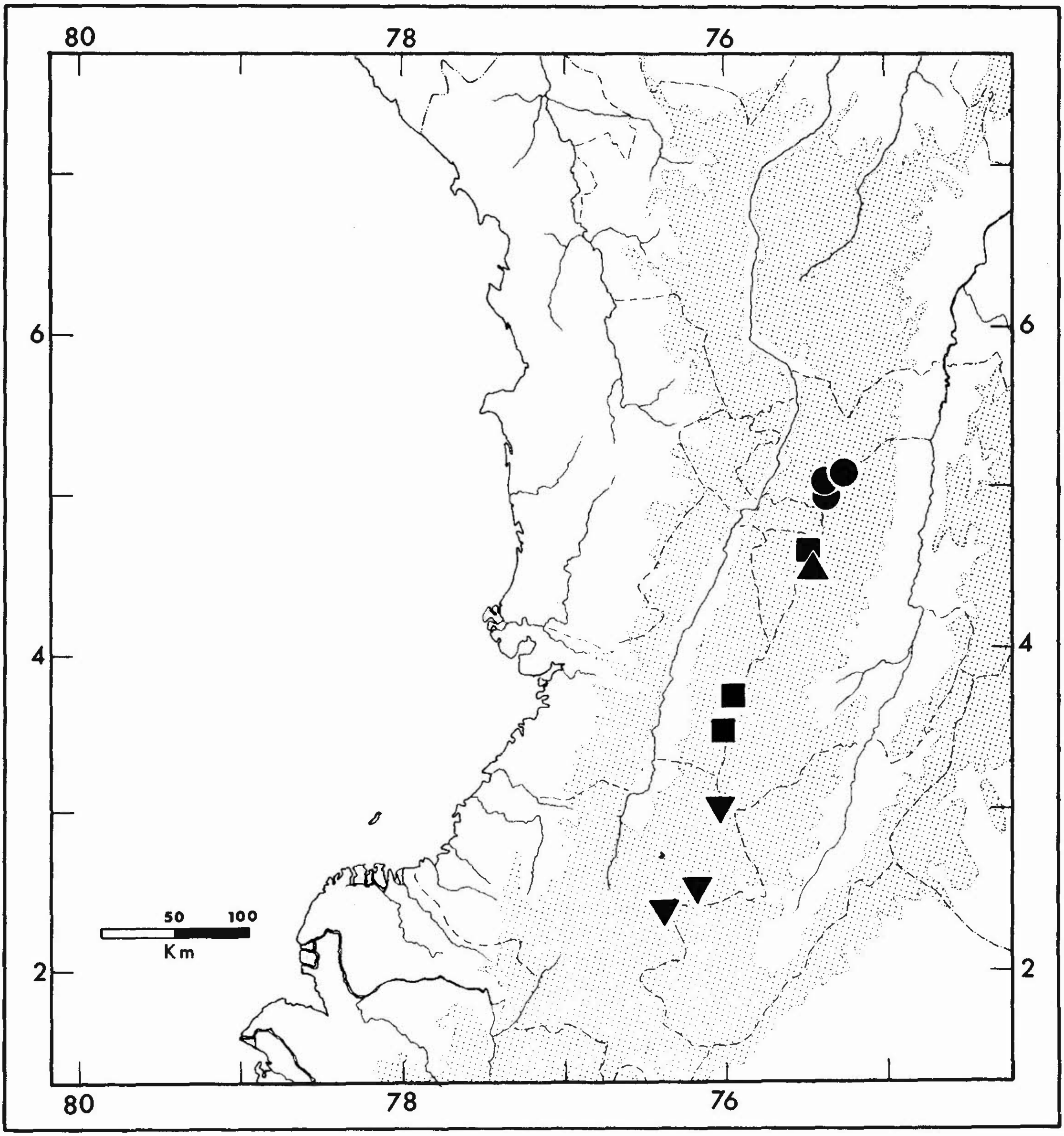

Figure 1. Map of western Colombia (areas above 1000 m stippled) showing the locality records for *Eleutherodactylus obmutescens* (inverted triangles), *E. raceus* (squares), *E. simoteriscus* (triangle), and *E. simoterus* (circles).

24 June 1984 in grass, on low herbs, at the bases of bushes, and on the ground when temperatures were only slightly above freezing. The call is a soft whistle, usually repeated. Females were found sitting on the ground at night. During the day, individuals were beneath rocks or fallen *Espeletia* trunks.

In life, *E. simoterus* is lime-green, golden-brown, reddish-brown, gray, or nearly black above with few brown or black markings (in some individuals the snout is a pale version of the ground color); the vocal sac is reddish with darker mottling (pink-orange at night); axillae, groin, and concealed surfaces of limbs rufous brown; gray or cream lichen-like markings on breast and anterior venter; chin yellow in males; throat and venter of females rufous brown; females reddish-brown above; iris deep copper with black flecks and reddish horizontal streak.

Only twelve adult individuals were known at the time of the description and one of those is now considered an immature male. As then suspected, the species is a frog of the páramo and is rather uncommon at the type locality (subpáramo). Adult males are 25.9-32.7 ($\overline{x}$ = 29.3 ± 0.5, N = 16) mm SVL and adult females are 31.4-39.0 ($\overline{x}$ = 35.7 ± 0.7, N = 11) mm SVL. Two males lacking nuptial pads, but having vocal slits, are here considered subadult males (22.8-25.0 mm SVL). Three juvenile females are 24.5-26.2 mm SVL (oviducts straight, not expanded) and one young female is 28.0 mm SVL (oviducts convoluted, only small ovarian eggs).

Less than 50 km to the south, MCA and PMR collected a series of frogs, superficially very similar to *E. simoterus*, on the Páramo de los Valles. In proportions, color, and skin texture these looked like juvenile *E. simoterus*. However, they are adult frogs and, in allusion to their being diminutive *E. simoterus*, are here named

Eleutherodactylus simoteriscus sp. nov.

HOLOTYPE. ICN-MHN 22835, an adult female, one of a series collected by *M. C. Ardila, M. Barrera,* and *P. M. Ruiz* on 5 April 1989.

PARATOPOTYPES. ICN-MHN 22833, 22836, 22837 (cleared and stained skeleton), 22838-47, collected syntopically.

Referred Specimens. ICN-MHN 22791, 22848, juvenile females taken with holotype.

TYPE LOCALITY. COLOMBIA. Departamento del Tolima. Municipio de Cajamarca, Páramo de los Valles, SW of Anaime, Anaime-Santa Helena road, 3580-3600 m alt.

Diagnosis

(1) skin of dorsum bearing large flattened warts, that of venter coarsely areolate; no dorsolateral folds; (2) tympanum prominent, round, its length one-quarter to one-half length of eye; (3) snout short, subacuminate in dorsal view, rounded in lateral profile; canthus rostralis evident; (4) upper eyelids narrower than IOD, lacking tubercles; no cranial crests; (5) vomerine odontophores low, oblique, widely separated medially; (6) males lacking vocal slits and nuptial pads; (7) first finger shorter than second, fingers bearing slightly expanded digital discs; (8) fingers bearing prominent lateral fringes; (9) ulnar tubercles absent or poorly defined; (10) no tubercles on heel or tarsus; (11) two metatarsal tubercles, inner oval, 3-5 times size of rounded outer; many supernumerary plantar tubercles; (12) toes bearing lateral fringes, no webbing; fifth toe much longer than third; toe discs smaller than those of outer fingers; (13)

dorsum gray with dark brown markings but no facial markings present; groin and posterior surfaces of thighs brown with or without silvery flecks; venter pale brown; iris bronze marked with brown (14) adults small, males 23.1-25.1 ($\overline{x}$ = 23.9 ± 0.3, N = 6), females 25.7-31.4 ($\overline{x}$ = 28.5 ± 0.7, N = 8) mm SVL.

Most like *E. simoterus*, but differing in being much smaller and because males lack vocal slits. *Eleutherodactylus simoteriscus* differs slightly in colors in life (iris color and what we take to be minor pattern differences). In spite of the similarities between the two frogs, we are confident that they are not conspecific although we think them to be sister species. The size difference between the two species cannot be a reflection of elevation because each occurs at the same elevations.

Description

(Proportions are based on six males and eight females). Head as wide as body (males) or narrower than body (adult females), wider than long; HW of males 37.3-41.6 ($\overline{x}$= 39.2 ± 0.7)% SVL, of females 38.5-43.1 ($\overline{x}$= 40.8 ± 0.6)% SVL; snout subacuminate in dorsal view, rounded in lateral profile; snout markedly short, E-N of males 51.4-81.5 ($\overline{x}$= 66.8 ± 4.4)% eye length, of females 65.8-93.4 ($\overline{x}$= 75.7 ± 3.1)% eye length; nostrils not or only weakly protuberant, directed laterally; canthus rostralis evident (edge rounded), concave; loreal región concave, sloping abruptly to lip; lips not flared; interorbital space flat; upper eyelid width of males 81.5-100.0 ($\overline{x}$ = 95.1 ± 2.8)% IOD, of females 64.1-87.9 ($\overline{x}$= 78.4 ± 2.8)% IOD; no tubercles on upper eyelid; temporal region swollen; supratympanic fold thickened, indistinct; tympanum prominent, round, separated from eye by distance equal its length (Fig. 2); tympanum length of males 25.7-37.0 ($\overline{x}$= 32.2 ± 1.6)% eye length, of females 25.7-48.6 ($\overline{x}$= 35.8 ± 2.6)% eye length; postrictal tubercles nonconical; choanae small, round, not concealed by palatal shelf of maxillary arch; vomerine odontophores low, oblique, bearing 2-4 teeth, separated on midline by distance equal a choana width; tongue longer than wide, posterior edge notched, posterior one-half not adherent to floor of mouth; males lack vocal slits.

Skin on top of head and arms smooth, over other dorsal surfaces bearing large flattened warts; divisions between warts most easily seen on flanks; no dorsolateral or paravertebral folds; skin of venter coarsely areolate; discoidal folds obsolete; no anal sheath, no enlarged subanal warts; antebrachial tubercle present, not well defined in several individuals (due to areolation of forearm); no other ulnar tubercles; palmar tubercle bifid, much larger than oval thenar tubercle; numerous supernumerary palmar tubercles; subarticular tubercles nonconical, round or slightly broader than long; fingers long, bearing thick fleshy fringes; fleshy keel along outside of palm; digital disks slightly expanded, ca 1 1/2 times width of digit below disk on III-IV, less on I-II; ventral pads wider than long; first finger shorter than second; males with swollen thumbs, lacking nuptial pads.

No tubercles on heel or tarsus; inner metatarsal tubercle 1 1/2 times as long as wide, outer rounded, subconical, 1/4 to 1/2 size of inner; supernumerary plantar tubercles numerous; subarticular tubercles nonconical, round; toes long, bearing thick fleshy fringes; digital disks smaller than those of fingers; fifth toe much longer than third (Fig. 2); heels do not touch when flexed hind legs are held perpendicular to sagittal plane; shank of males 43.0-46.8 ($\overline{x}$= 44.7 ± 0.6)% SVL, of females 44.3-49.5 ($\overline{x}$ = 47.6 ± 0.6)% SVL.

Dorsum gray, with or without dark brown interorbital bar, reverse parentheses in scapular-sacral region or brown flecking over dorsal surfaces; no canthal-supratympanic stripe, labial bars, or limb bars; flanks darker than dorsal surfaces; ventral surfaces uniform dirty

cream to pale brown but occasional individuals have suggestions of marbling/reticulation over abdomen; groin and posterior surfaces of thighs brown with silvery flecks or not; in some individuals (e.g., ICN-MHN 22843), there are pale spots in the groin and on the posterior surfaces of the thighs.

Two juveniles depart from this description. ICN-MHN 22791 has a cream venter with some brown flecking on breast. Its dorsum is cream with dense brown markings (interorbital bar, reverse parentheses, limb bars, oblique bars on flanks, canthal-supratympanic stripe, and labial bars. ICN-MHN 22848 is brown above with darker flecks and bears white spots along the lower flank (axilla to groin) and on the posterior surfaces of the thighs. Its ventral surfaces are cream with modest brown reticulation on the throat and dense brown reticulum over the belly and ventral surfaces of the limbs.

In life, *E. simoteriscus* is pale yellowish-green to reddish brown above with or without black dorsolateral spots; throat and venter greenish yellow with cream or pale brown spots; iris bronze with brown flecks and lines.

Measurements of holotype in mm. SVL 30.1, shank 14.9, HW 12.3, head length 10.5, chord of head length 12.1, upper eyelid width 2.6, IOD 3.8, tympanum length 1.5, eye 3.7, E-N 2.6.

Natural history

Frogs were under trunks, rocks, and decomposing *Espeletia*. The two juveniles are females, 15.8-17.3 mm SVL.

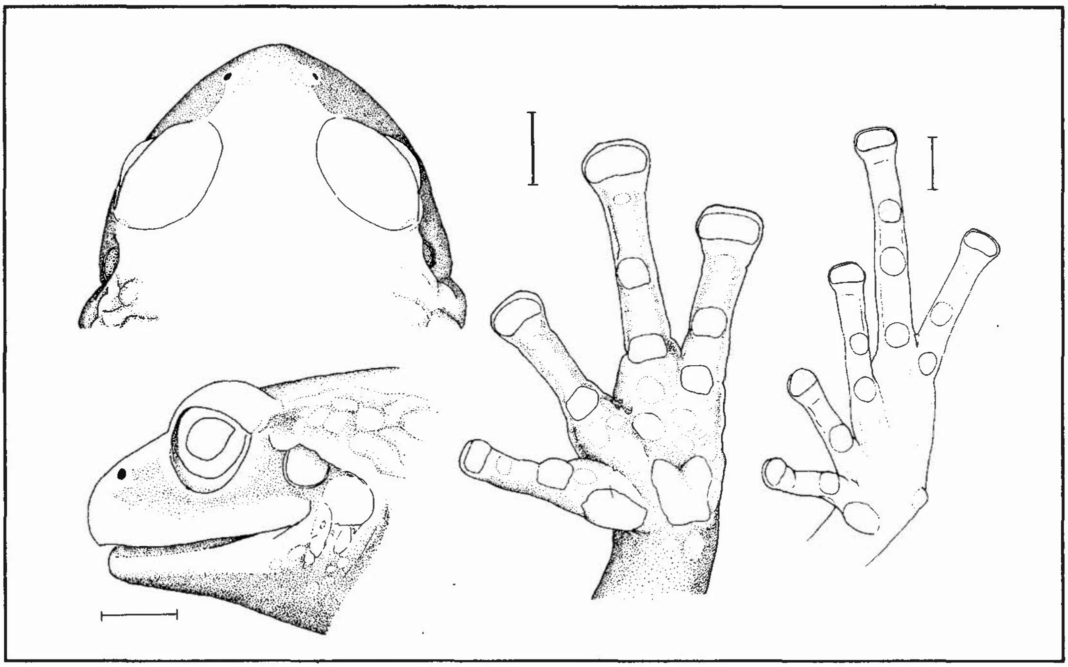

Figure 2. *Eleutherodactylus simoteriscus.* Head (ICN-MNH 22835), hand (ICN-MHN 22836), and foot (ICN-MHN 22840). Scales equal 2 mm.

At the Páramo de los Valles, the collectors found only three species of eleutherodactylines. In addition to *E. simoteriscus,* they obtained one individual of *E. permixtus* and five males of another dwarf species. One of the dwarf males (ICN-MHN 22834) grasped a female *E. simoteriscus* (ICN-MHN 22833) in the collecting bag but the others were presumed to be simply juveniles of *E. simoteriscus*. However, each of the five specimens is an adult male of a dwarf species here named

Eleutherodactylus scopaeus sp. nov.

HOLOTYPE. ICN-MHN 22792, obtained by *M. C. Ardila, M. Barrera,* and *P. M. Ruiz* 5 April 1989.

PARATOPOTYPES. ICN-MHN 22789-90, 22793, 22834, taken with holotype.

TYPE LOCALITY. COLOMBIA. Departamento del Tolima. Municipio de Cajamarca, Páramo de los Valles, SW of Anaime, Anaime-Santa Helena road, corregimiento Anaime, 3580-3600 m alt.

Diagnosis

(1) skin of dorsum smooth to finely granular, that of venter coarsely areolate; low dorsolateral folds; (2) tympanum and tympanic annulus absent; (3) snout subacuminate in dorsal view; canthus rostralis rounded; (4) IOD broader than upper eyelid; no cranial crests; no tubercles on upper eyelids; (5) vomerine odontophores low, oblique; (6) males with vocal slits, no nuptial pads; (7) first finger slightly shorter than second; no digital disks, ventral surface of disks bearing long pads; (8) faint lateral keels on digits; (9) no ulnar tubercles obvious; (10) no tubercles on heel or tarsus; (11) two metatarsal tubercles, inner oval, twice size of round outer; many supernumerary plantar tubercles; (12) no lateral keels on toes, no disks, all toes bearing ventral pads; fifth toe only slightly longer than third; (13) brown above with little pattern evident; anal triangle present; groin cream with brown reticulations; posterior surfaces of thighs cream with brown spots; venter cream; (14) adults small, males 15.3-16.7 ($\bar{X}$= 15.8 ± 0.3, N = 5) mm SVL.

Eleutherodactylus scopaeus is readily distinguished from the other small *Eleutherodactylus* having narrow digits by virtue of lacking a tympanum and the tympanic annulus. It may be most closely related to *E. ocreatus* Lynch and *E. repens* Lynch but each of these has tympanic annuli (but no tympanum present in *E. ocreatus*).

Description

Head as wide as body, longer than wide; HW 37.1-39.8 (x = 38.7 ± 0.4)% SVL in males; snout short, E-N 63.6-77.8 ($\bar{X}$= 68.3 ± 2.5)% eye length in males; snout subacuminate in dorsal view, rounded in lateral profile; nostrils slightly protuberant, directed dorsolaterally; canthus rostralis rounded, but distinct, concave; loreal region concave, sloping abruptly to lips; lips not flared; interorbital space flat; upper eyelid width 66.7-85.0 ($\bar{X}$= 79.0 ± 3.7)% IOD in males; upper eyelid lacking tubercles; temporal región swollen, bearing low warts; supratympanic fold thickened but distinct, bearing subconical warts; no tympanum; postrictal tubercles subconical, fused as short ridge; many small pustule-like tubercles on side of head where tympanum is expected; choanae small, round, not concealed by palatal shelf of maxillary arch; vomerine odontophores minute, oblique, scarcely protruding above tissue of palate, median and posterior to choanae, bearing 2-4 teeth in a slanted row; tongue twice as long as wide, posterior 2/5 not adherent to floor of mouth, posterior edge feebly notched; short vocal slits posterolateral to tongue in males.

Skin of dorsum nearly smooth but with anastomosing ridgelets and very fine granules on lower back; a pair of ill-defined dorsolateral folds from eye to above groin; skin lateral to folds coarsely areolate; skin of venter coarsely areolate; no discoidal folds; anal opening not extended; undersides of thighs coarsely areolate, no enlarged subanal tubercles; dorsal and ventral surfaces of forearm areolate but some slightly enlarged tubercles along ulnar surface; palmar tubercle bifid (or divided, smaller lobe lateral), slightly larger than oval thenar tubercle; large supernumerary palmar tubercle at base of each digit; subarticular tubercles round, nonconical, distal tubercles smaller than basal ones; fingers bearing lateral keels; digital disks not or only slightly wider than digit, round apically (Fig. 3); ventral pads as wide as long; first finger slightly shorter than second when each is adpressed equally; thumb of male swollen, no nuptial pad.

Dorsal surfaces of hind limb bearing flattened warts; ventral surface of tarsus areolate but no obvious tubercles on heel or outer edge of tarsus; inner edge of tarsus appears to have some tubercles (median edge of areolate region); inner metatarsal tubercle 1 1/2 times as long as wide, outer metatarsal tubercle round, non-conical, 1/2 size of inner; plantar surface areolate; subarticular tubercles low, round; toes long, lacking lateral keels but flattened; digital tips not expanded, round apically, ventral pads as long as wide or slightly wider than long; toe V slightly longer than toe III, tip of III extending to distal edge of penultimate subarticular tubercle of toe

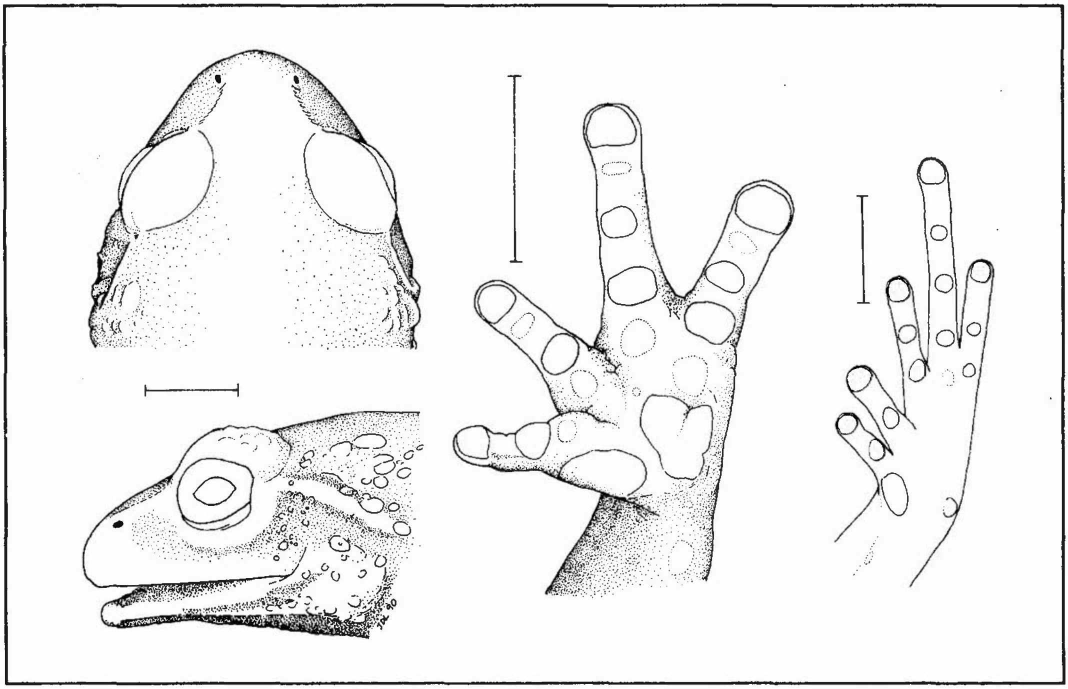

Figure 3. *Eleutherodactylus scopaeus*. Head (ICN-MHN 22793), Hand (ICN-MHN 22792), foot (ICN-MHN 22793). Scales equal 2 mm.

IV, tip of V reaching about a half pad farther (Fig. 3); heels touch when flexed hind limbs held perpendicular to sagittal plane; shank 41.2-43.8 ($\bar{x}$= 42.4 ± 0.5)% SVL in males.

Dorsum brown with slightly darker mottling (except ICN-MHN 22789); canthal-supratympanic stripe dark brown; labial bar just in front of eye; (ICN-MHN 22789 has dorsoconcolor pattern, reddish-brown above with faint cream highlight to inner edge of dark dorsolateral line; upper flanks slightly darker than dorsum); anal triangle brown; limb bars feebly developed except on top of thighs; posterior surfaces of thighs dirty cream with brown spots and reticulum; venter cream; groin and fronts of thighs cream with brown reticulum forming dark line at edge of venter.

Only one individual had colors in life recorded because most were confused with juveniles of *E. simoteriscus* in the field. ICN-MHN 22834 was pale brown with black dorsolateral spots; heel and elbow black; dark brown transverse line on thighs and shanks. Measurements of holotype in mm. SVL 16.1, shank 6.8, HW 6.4, head length 6.5, chord of head length 7.0, upper eyelid width 1.6, IOD 2.4, eye length 2.1, E-N 1.4. The testes are white.

Remarks. *Eleutherodactylus scopaeus* is assigned tentatively to the *E.myersi* species group and series as redefined by LYNCH & DUELLMAN (1996). Unlike those species, *E. scopaeus* has the fifth toe longer than the third, although the fifth toe is much shorter than in most Andean *Eleutherodactylus*. Further speculation on the relationships of this peculiar little frog must await the collection of females and anatomical data.

Twenty years ago, PMR visited the Páramo de las Letras in northwestern Departamento Tolima and obtained a single adult female of a large black *Eleutherodactylus*. Specimens of this species have been slow to accumulate but adequate material is available now to describe it.

Eleutherodactylus piceus sp. nov.

HOLOTYPE. ICN-MHN 17174, an adult female obtained by *Pedro M. Ruiz* on 17 August 1987.

TYPE LOCALITY. COLOMBIA. Departamento de Tolima. Municipio de Herveo, Km 235-236, carretera Mariquita-Manizales, región Páramo de Letras, 2790 m alt. (primary forest along roadside).

PARATYPES. COLOMBIA. ANTIOQUIA. Municipio de Sonsón, Páramo de Sonsón, 17 km de Sonsón vía La Dorada, 2800 m alt., ICN-MHN 18596, ca 22 km de Sonsón, vía La Dorada, 2540-2560 m alt., ICN-MHN 18801. CAUCA. Municipio de Inzá, Río Sucio, Alto de Guanacas, Km. 62, 2700 m alt., UVC 10716. QUINDIO. Municipio de Salento, Finca La Montaña, vereda Río Arriba, 4.3 km E La Cocora, 2650-2780 m alt., ICN-MHN 25544-45, 2780-2900 m alt., ICN-MHN 25543, 3100 m alt., ICN-MHN 25546. TOLIMA. Municipio de Herveo, subpáramo de Letras, vereda Albania, 3200 m alt., ICN-MHN 3185, 4104, 4841, 6236, Km 77-79 carr. Manizales-Mariquita, 3310-3340 m alt., ICN-MHN 18820; Municipio de Ibagué, above El Rancho (termales) along Río Combeima, vereda Las Juntas, 2800-2820 m alt., ICN-MHN 8565-66, por la carretera de El Silencio hacia arriba por la derecha, vereda Las Juntas, 2830-2980 m alt., ICN-MHN 22573-75.

Referred specimens. ANTIOQUIA, Municipio de Medellín, Serranía de las Valdías, 5.6-5.7 km por carretera hacia Boquerón desde Inspección de Policía "San Félix", 2860-2940 m alt., ICN-MHN 20412; Municipio de Sonsón, Páramo de Sonsón, 17 km de Sonsón vía La Dorada, 2800 m alt., ICN-MHN 18802-04. CAUCA. Municipio de Páez, cabaña INDERENA "La Termal", Parque Nacional Natural Nevado del Huila, Km 42 carretera Belalcázar-Tacueyó, 2820 m alt., ICN-MHN 6417, 6497-99, 2-3 km below cabaña "La Termal" (Km 39-40 carretera Belalcázar-Tacueyó), 2750-2790 m alt., ICN-MHN 6981-83, Km 34.5 carretera Belalcázar-Tacueyó, 2400 m alt., ICN-MHN 6502-03, Km 46-49.5, carretera Belalcázar-Tacueyó, 3200-3300 m alt., ICN-MHN 7057, 7062. QUINDIO. Municipio de Salento, Finca La Montaña, vereda Río Arriba, 4.3 km E La Cocora, 2650-2900 m alt., ICN-MHN 25537-42, 25547. TOLIMA. Municipio de Ibagué, above El Rancho along Río Combeima, vda. Las Juntas, 2800-2820 m alt., ICN-MHN 8567.

Diagnosis

(1) skin of dorsum bearing numerous minute low warts; that of venter areolate; no dorsolateral folds; (2) tympanum distinct, superficial, round, 32-44% eye length; (3) snout long, subacuminate in dorsal view, round in lateral profile; canthus rostralis distinct, concave; (4) IOD broader than upper eyelid; edges of frontoparietals upturned in females; (5) vomerine odontophores oval; (6) males with vocal slits, subgular vocal sac; no nuptial pads; (7) first finger slightly shorter than second; digital disks on fingers II-IV narrow, weakly emarginate, slightly larger than tympanum; (8) fingers long and slender, bearing lateral keels; (9) low ulnar tubercles; (10) minute tubercle on heel, minute tubercle on inner edge of tarsus; (11) two metatarsal tubercles, inner oval, three times size of round outer; numerous supernumerary plantar tubercles; (12) toes slender with lateral keels, digital disks smaller than those of fingers; fifth toe much longer than third; (13) black on all dorsal surfaces in populations from Antioquia and Tolima; frogs from Cauca are densely spotted with dark brown; adults large, males 29.2-40.7 ($\overline{X}$= 36.2 ± 1.4, N = 9) mm SVL, females 39.5-49.5 ($\overline{X}$= 43.6 ± 1.4, N = 9) mm SVL.

By virtue of its coloration, *E. piceus* is readily distinguished from nearly all other *Eleutherodactylus*. In addition, it is a relatively large frog. In many respects, it resembles *E. anolirex, E. devillei, E. permixtus, E. supernatis, E. thymalopsoides*, and *E. vertebralis* but presents a unique combination of character states [no dorsolateral folds, vocal sac present, low cranial crests] and has smaller digital disks.

Description

Head slightly broader than body (except in gravid females), head wider than long; HW of males 39.2-42.4 ($\overline{X}$= 40.8 ± 0.3)% SVL, of females 36.5-40.4 ($\overline{X}$= 37.8 ± 0.4)% SVL; snout rounded to subacuminate in dorsal view, rounded in lateral profile; snout long, E-N of males 84.0-97.4 ($\overline{X}$= 92.2 ± 1.7)% eye length, of females 79.6-93.8 ($\overline{X}$= 87.8 ± 2.1)% eye length; nostrils not protuberant, directed dorsolaterally; canthus rostralis concave, not sharp; loreal region concave, sloping abruptly to lips; lips not flared (or only weakly flared in larger females); upper eyelid lacking distinct warts; upper eyelid width in males 69.4-128.2 ($\overline{X}$= 90.1 ± 5.8)% IOD, of females 66.7-113.6 ($\overline{X}$= 88.2 ± 5.3)% IOD; interorbital space bearing low cranial crests in larger adults (crests are low upturned edges of frontoparietals); tympanum round, annulus distinct (except dorsally), separated from eye by distance equal to one and one half diameters of tympanum; tympanum length in males 31.8-45.4 ($\overline{X}$= 38.1 ± 1.6)% eye length, of females 32.7-42.3 ($\overline{X}$= 37.4 ± 0.9)% eye length; supratympanic fold low, obscuring upper edge of tympanum; two conical postrictal tubercles; choanae oval, not concealed by palatal shelf of maxiallary arch; vomerine odontophores median and posterior to choanae, narrowly separated (ca 1/3 width of an odontophore), each about same size as or slightly larger than a choana, bearing about 5-6 teeth in a transverse row; tongue one and one-half times as long as wide, its posterior third not adherent to floor of mouth, posterior edge notched; males with long vocal slits posterolateral to tongue; vocal sac large, external, subgular.

Skin appears smooth but is actually finely corrugated (low warts evident on lower back); traces of postocular folds; flanks slightly more rugose than dorsum; limbs relatively smooth above; venter and undersides of thighs coarsely areolate; skin of throat relatively smooth; discoidal folds well anteriad to groin; no anal sheath or enlarged postanal tubercles; 4-5 low ulnar tubercles; palmar tubercle bifid, about twice size of oval thenar tubercle; low supernumerary tubercles on palm; fingers long slender, bearing lateral keels; all fingers with disks, that of thumb scarcely expanded (Fig. 4), that of Finger II 1.5 times width of digit below disk, those of Fingers III-IV 2.0 times width of digit; disk of third finger broader than tympanum; broad ventral pads on undersides of disks, defined by complete circumferential grooves; first finger shorter than second.

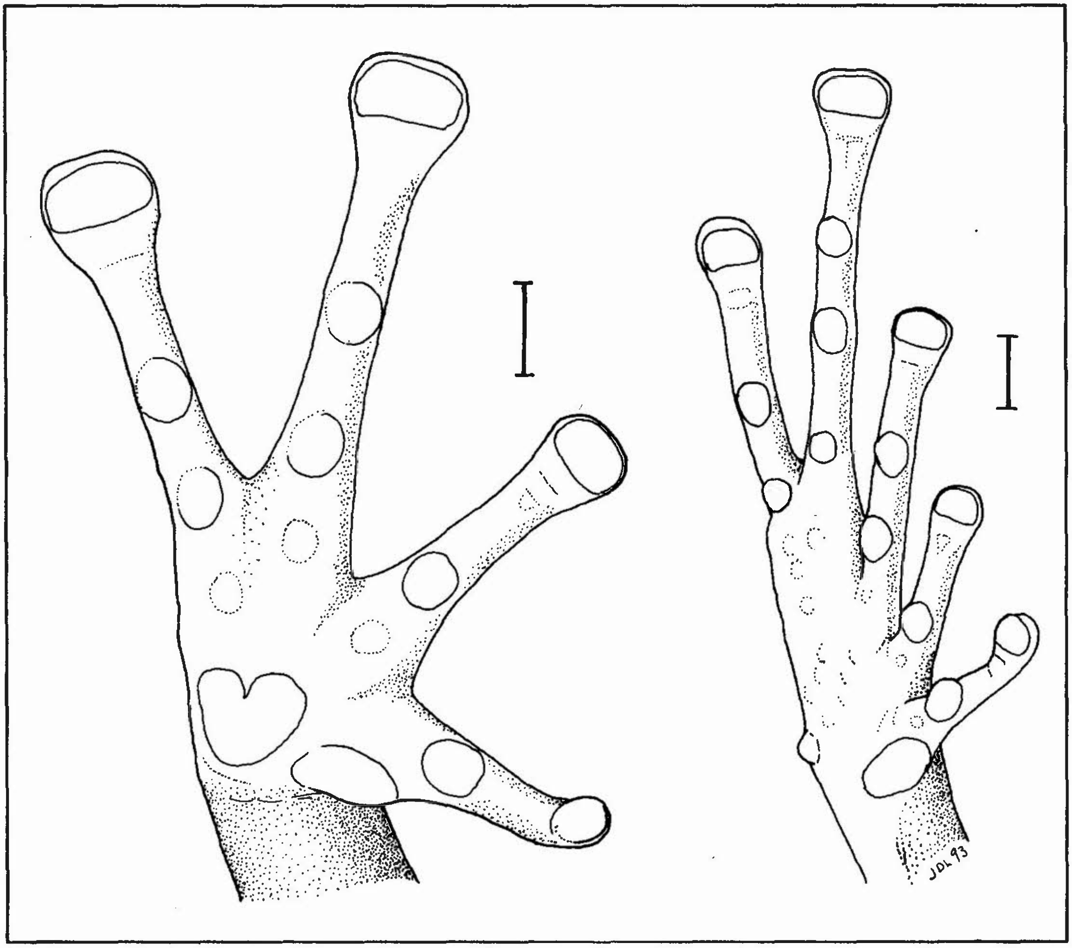

Figure 4. *Eleutherodactylus piceus.* Hand and foot (ICN-MHN 17174). Scales equal 2 mm.

No heel tubercle or outer tarsal tubercles, or such tubercles minute; 1-2 low inner tarsal tubercles, just proximal to inner metatarsal tubercle; inner metatarsal tubercle twice as long as wide, four times size of rounded low outer; supernumerary plantar tubercles not discrete; toes long and slender; fleshy keels on toes (fringe-like at bases of toes); fifth toe much longer than third when each is adpressed against Toe IV; tip of fifth toe reaches to distal edge of distal subarticular tubercle of Toe IV, tip of third toe reaches to middle of penultimate subarticular tubercle of toe IV (Fig. 4); toe disks smaller than those of fingers; when flexed hindlimbs held perpendicular to sagittal plane, heels barely overlapping; heel of adpressed hindlimb reaches to anterior edge of tympanum; shank of males 47.1-54.1 ($\bar{x}$= 51.0 ± 0.7)% SVL, of females 44.8-52.9 ($\bar{x}$= 48.3 ± 0.9)% SVL.

Dorsum reddish-brown to nearly black above, sometimes bearing dull ochre spots, occipital folds, or rarely (ICNMHN 22573-74) with pale lines outlining sacral chevron and limb bars; white flecks often visible along upper lip; venter dark brown to black, frequently with white flecks along margin of lip, but sometimes reticulated with cream forming loose network of vermiculations; groin, anterior and posterior surfaces of thighs black, sometimes bearing white flecks or spots.

In life, *E. piceus* is usually uniformly black, reddish-brown, or dark brown with a pale blue periocular ring. Many specimens also have orange spots on the flanks. White flecks are usually evident along the margin of the mandible. The iris is described by collectors as black, chocolate, or dull bronze with yellowish flecks.

Measurements of holotype in mm SVL 49.5, shank 22.2, HW 18.7, head length 16.4, chord of head length 18.0, upper eyelid width 4.9, IOD 4.6, tympanum length 2.0, eye length 5.5, E-N 5.0.

Natural history

These frogs commonly secrete a white or blue-white mucus when first collected (or molested). We presume that this sticky secretion is offensive and serves to reduce likelihood of predation. Juvenile males (no vocal slits) reach a body size of 26.8 mm (ICN-MHN 6236, 22574). Females lacking convolutions of the oviducts are usually less than 33 mm SVL with the exception of ICN-MHN 18820 (37.5 mm SVL). Young females, having some convolutions of the oviducts, but only minute ovarian eggs, are 34.0-37.0 mm SVL.

Eleutherodactylus piceus enjoys a broad distribution along the Cordillera Central (Fig. 5) in subpáramo (2540-3340 m). The species remains sufficiently uncommon that we are not yet willing to argue that the sample from Nevado de Huila (Cauca) represents geographic, or some other sort of, variation. Those frogs (see referred specimens) are distinctive because their color pattern is brown with darker brown (or black) spots over the dorsum. The venter is spotted as well, but less obviously than the dorsum.

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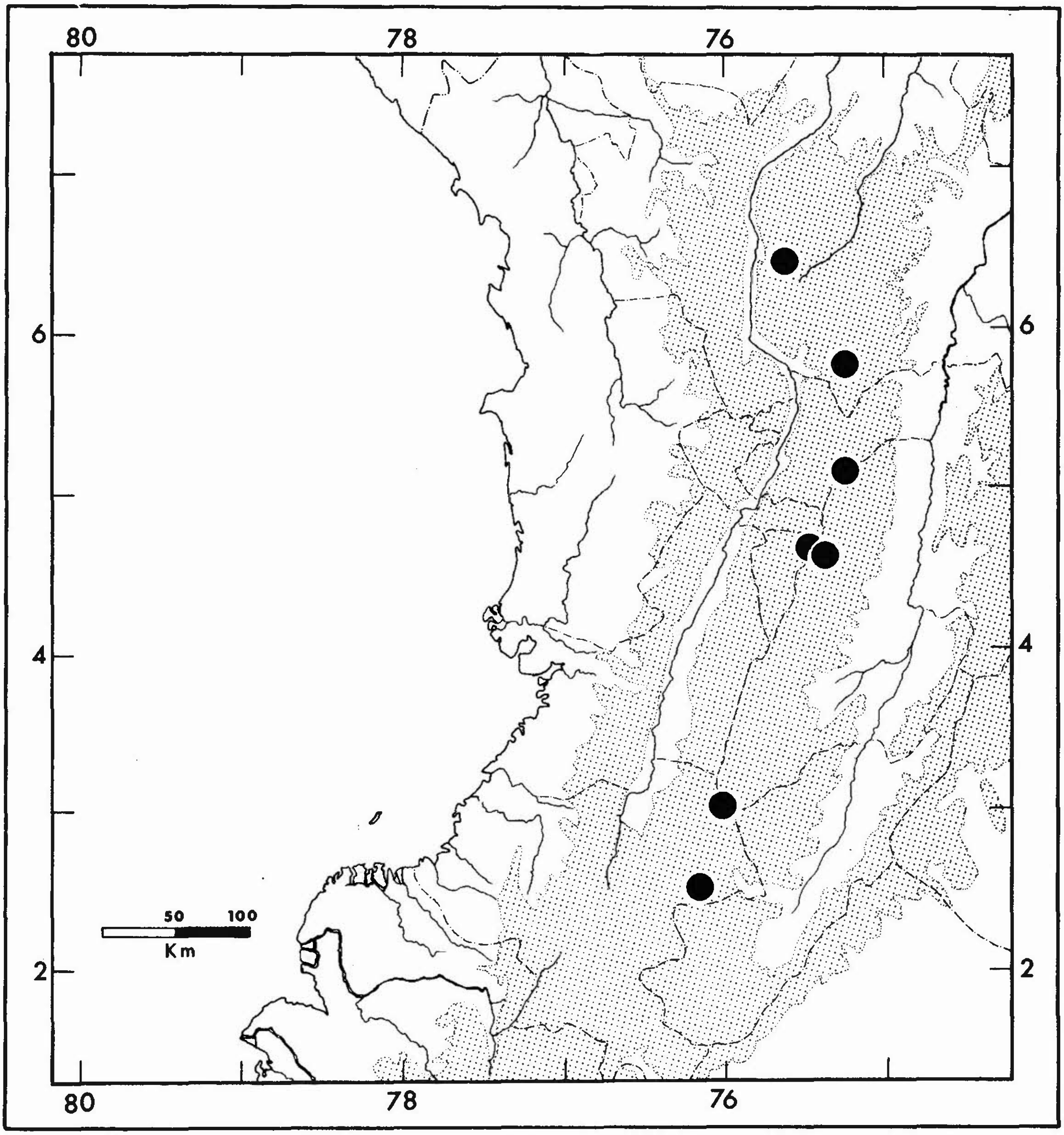
80
78
76
80
78
76
6
4
2
6
4
2
50
100
Km

Figure 5. Map of western Colombia showing locality records for *Eleutherodactylus piceus*.

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